IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Dubois et al.

Serial No.: 09/851,732

Filing Date: 05/08/2001

For: SIX SIGMA ENABLED WEB-BASED BUSINESS INTELLIGENCE SYSTEM

Examiner: Sterrett, Jonathan G.

Art Unit: 3623

Conf. No: 3656

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION OF PRIOR INVENTION IN THE UNITED STATED TO OVERCOME CITED REFERENCE (37 CFR 1.131)

Dear Sir:

My name is Jacques Senchet. I am an inventor of subject matter of the above-identified Patent Application. The above identified Patent Application was assigned to ORACLE CORPORATION, a Delaware Corporation having its principal place of business at 500 Oracle Parkway, Redwood Shores, California 94065 which in turn assigned to ORACLE INTERNATIONAL CORPORATION (OIC), a corporation of California, having its principal place of business at 500 Oracle Parkway, Redwood Shores, California 94065.

The declaration made hereof is to establish invention of the subject matter of the above-identified Patent Application to overcome the publication of the Cognos White Paper "Constructing the Integrated Data Warehouse with Cognos e-applications", Sept 2000, pp1-19.

Conception

The subject matter of the present invention was conceived prior to September 2000 as evidenced by information included in the internal confidential Oracle White Paper entitled "Six Sigma Enabled Business Intelligence System", dated May 2000 (Attached as Exhibit A) and portions of the internal confidential Oracle paper entitled "Six Sigma Enabled Statistical Intelligence Feature (SsESI) High Level Design Oracle Business Intelligence System" created in November 1999 and last updated September 20, 2000 (Attached as Exhibit B). Some portions of the documents have been removed for reasons of Confidentiality. The bulk of the "SsESI High Level Design Oracle Business Intelligence System" document was completed prior to September 2000 and the updates indicated on September 20, 2000 were directed to correcting wording changes.

Diligence in Reduction to Practice

Applicants proceeded in the normal course of business and were diligent from prior to September 2000 to the filing on November 13, 2000 of the U.S. Provisional Application entitled "Six Sigma Enabled Business Intelligence System", Application Number 60/248,267.

Declaration

I, Jacques Senchet, hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code, and that such willful statements may jeopardize the validity of the application or any patent issued thereon.

Dated: 07/09, 2008

Jacques Senchet

Exhibit A

Copy of portions of the internal confidential Oracle White Paper entitled "Six Sigma Enabled Business Intelligence System", dated May 2000.

Six Sigma Enabled Business Intelligence System

An Oracle White Paper

May 2000

Introduction

The old ways of running a business are gone, to survive today companies must continuously improve quality and reduce the variability in every process throughout the organization. Access to data and the capability to analyze that data is the key to reducing defects and increasing customer satisfaction, thus leading to increased productivity and greater top and bottom line growth. Oracle is uniquely positioned to offer Six Sigma and advanced statistical analysis as part of its integrated, Data Warehouse architected, Business Intelligence System.

What is Six Sigma and what is all the hype about?

Six Sigma is a philosophy, a metric, a strategy, and a goal that provides a means for pursuing continuous quality improvement and reducing inherent variability in every process throughout a business. It provides a systematic means of understanding customer driven expectations, understanding product and process capability, and reducing defects. In the case of Six Sigma analysis, a defect can be related to any measure that exceeds a target; such as quality, deliveries, employee turnover, forecasts, etc.

As a philosophy, Six Sigma is a method used to achieve world class performance through the continuous reduction of defects. The focus on defects is designed to shift people's perception from "96% good" to "40,000 defects per million opportunities bad." It concentrates on customer needs, and allows the organization to understand what is important to the customer, thereby helping the organization to set the right priorities in order to capture market share and increase profitability.

Benefits for companies have reached into the billions as a result of Six Sigma programs.

As a metric, sigma is a statistical parameter that corresponds to a standard deviation on a bell curve. The number of deviations between the statistical mean (average) and the customer defined limits of acceptability provides a quantifiable measurement of process performance. As the process capability increases, so does the sigma level of the process. A process that performs at the Six Sigma level contains 3.4 defects per million opportunities (DPMO).

Each company that undertakes a Six Sigma effort seems to view it as an integral part of their strategy. One strategy can focus on enhancing existing processes, while another can focus on designing and developing new products or processes.

Perhaps the true power of Six Sigma is the goal that it sets for an organization. While it is possible to reach Six Sigma levels of quality in a process or product, it is unlikely that all process or products in a company will reach such exacting levels of quality. However, the good that is created through the pursuit of this goal is what creates the tremendous return on investment seen at companies like Motorola and GE.

The result of such a methodology can increase customer satisfaction and reduce the cost of poor quality, thus leading to increased productivity and greater top and bottom line growth. Six Sigma companies are characterized by a culture led by data analysis and scientific thought, as opposed to decision making based on intuition. It is this culture of data-based thought that ultimately pushes the processes toward Six Sigma and drives financial benefits.

What is Oracle's Business Intelligence System?

Business Intelligence is a growing trend to provide an integrated view of your business, extend analytical capabilities to more users, and leverage the data and expertise that is distributed throughout the organization. Oracle's Business Intelligence System (BIS) has been designed specifically to help customers navigate the maze of technologies, models, and strategies, and to provide a complete, integrated environment for business analysis across the full range of enterprise needs.

Enabling faster, better, and more informed business decisions

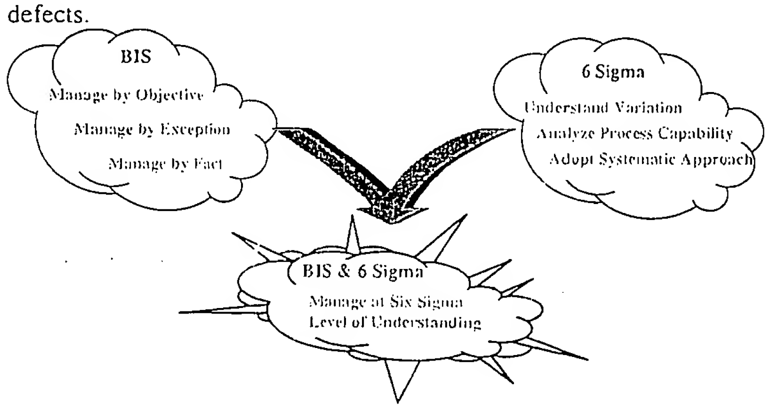
Oracle is uniquely qualified to deliver an integrated business intelligence solution because it offers best-of-breed products in every key technology area – from the sophisticated data management and analysis capabilities in Oracle 8i, to Oracle Warehouse Builder's end-to-end solution for designing and implementing a data warehouse, to a comprehensive suite of data access tools that work together to create a seamless analytical environment.

Oracle's BIS is a web based tool that allows the user to view and analyze Performance Measures (KPI's) across the business enterprise by providing:

- A prebuilt set of Reports to view data in a graphical and/or tabular format
- Seamless drill down to lower level of data
- Ad-hoc query analysis
- An alert mechanism used to proactively communicate actual to target performance
- A workflow mechanism to distribute alerts/notifications effectively to the appropriate responsible party(s).
- A library of Performance Measures or Key Performance Indicators (KPI's) to benchmark actual performance against multiple targets, e.g., industry best practices, key competition, corporate commitments, forecasts, budgets, etc.
- The Oracle Enterprise Data Warehouse, which is a single prepackaged repository of global data to include fact tables, dimensions, and collection packs for collecting and storing enterprise wide data

The power of integrating Six Sigma analysis and BIS?

Six Sigma is built on a foundation of methodical statistical analysis. This analysis is comprised mainly of previously known and proven statistical analysis tools, such as Process Capability, Normal Distribution, Analysis of Variance, etc. What makes Six Sigma unique, is the rigid methodology of applying these tools to meet the end result of increased customer satisfaction and reduced defects.

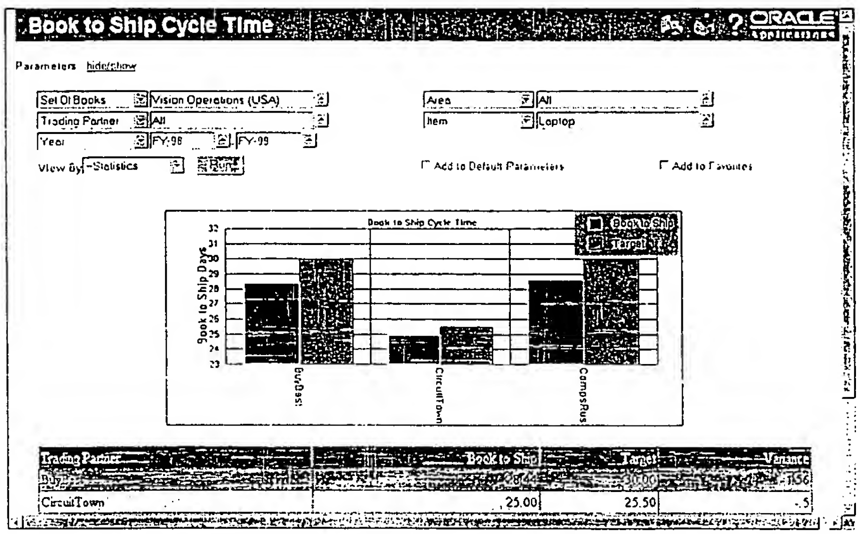


BIS & Six Sigma: Integrated Six Sigma Analysis of Enterprise Performance

Six Sigma analysis uses many advanced statistical measures to analyze data, which is where the integration with BIS becomes so powerful. Adding Six Sigma analysis capability to BIS creates a perfect union that allows for a comprehensive statistical understanding of Key Business Performance Measures. Six Sigma enabled BIS offers a single pipeline for a multidimensional view of data with a thorough understanding of variation and process capability.

A typical BIS report

The typical BIS report offers a comprehensive view of a given Performance Measure. It provides a standard bar or line graph, etc. to view the actual data, user defined targets, and variance. Under each graph is a more complete view of the data in a tabular format, including sums or averages of each column desired. To allow the user flexibility, there are many dimensions and parameters by which to filter and view the report.



Statistical view of Business Intelligence

Understanding variation is the key to process control

Viewing Performance Measures with line graphs, bar charts, pie charts, etc. is a good standardized way of analyzing data, but in many scenarios is not enough to get complete and thorough understanding of the actual process capability. Often, more advanced statistics are required to understand the entire issue or discover opportunities that would normally be overlooked. Six Sigma enabled reports would portray the same data in a histogram (bell curve) format, that displays the variation of the data along with various other statistical measures. Analyzing data with Six Sigma enabled BIS helps you see more details of the data and have a better and more confident understanding of what is driving the higher level "averages" and variation. This Six Sigma analysis feature can be turned on or off for existing BIS reports, where applicable.

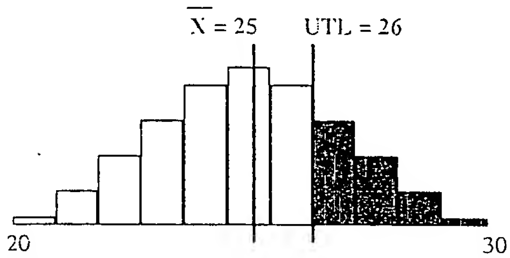
For an example of a Six Sigma enabled BIS report, first consider the Book to Ship cycle time in the typical BIS report above. Here, the Book to Ship cycle time is viewed by Time or Customer, etc. and the calculations are higher level summaries of the Book to Ship cycle time for each Sales Order Line. In this example, the Book to Ship cycle time for CircuitTown is an average of 25 days. If the Upper Target Limit (UTL) is 26 days, you might feel confident that your process is under control and your customer is happy. However, if you analyze more closely using the Six Sigma enabled report below, you might find that the

distribution (or variation) of Book to Ship cycle times range from 20 to 30 days and that 27% of your cycle times are above your UTL, which could potentially lead to an unhappy customer. This would also be evident by the low Sigma value (2.1) as seen below.

Set of Books: Vision Operations (USA)
Trading Partner: CircuitTown
Year: FY-98 to FY-99
Area: All
Item: Laptop
View By: Statistics
Run

Book to Ship Cycle Time

Lower Target Limit: (Default will use PMF)
Upper Target Limit: 26 (Default will use PMF)
\# of Bins: 11 (Blank will use Default value)
Range: From 20 To 30 (Blank will retrieve values)



Measure	Mean	Standard Dev	Median	Actual <LTL	Actual >UTL	95% CI	n	Target	A-D Norm	DPMO	Sigma
Book to Ship Days	25	1.7	24.5		27%	21 - 29	1500	25.5	0.06	273,451	2.1

There is a 28% probability of being above the Upper Target Limit (UTL) and a 0% probability of being below the Lower Target Limit (LTL). The overall risk of being outside of the Target Limits is 28%. **(This is based on the assumption of Normal Data)**

Dynamic interaction with the actual data

A unique feature offered by this reporting format is the ability to interact with the actual data. Several fields on the report allow you to modify and rerun the analysis.

Real time interaction with your data is the key to efficient analysis

- The Target Limits are defaulted by what was stored in the BIS Performance Management Framework (PMF), but you can change the values and rerun the analysis to understand the impact.
- The number of bins (bars in the histogram) can be changed to allow for a more/less granular view of the data.
- The range can be changed to allow for deeper analysis of a specific area of data or to possibly eliminate the analysis of outlying data.

An advanced statistical view of the data answers many questions

Six Sigma enabled BIS reporting helps answer business questions such as:

- For any given Performance Measure, what is the distribution (variation) of the data?
- What is the impact on my Performance Measure if I simulate a change in the Mean, Standard Deviation, Target Limits, # of Bins, or Range?
- What level of improvement would I get if I reduced my "defects" by 20%?
- What is my risk of being out of tolerance on any given performance measure?

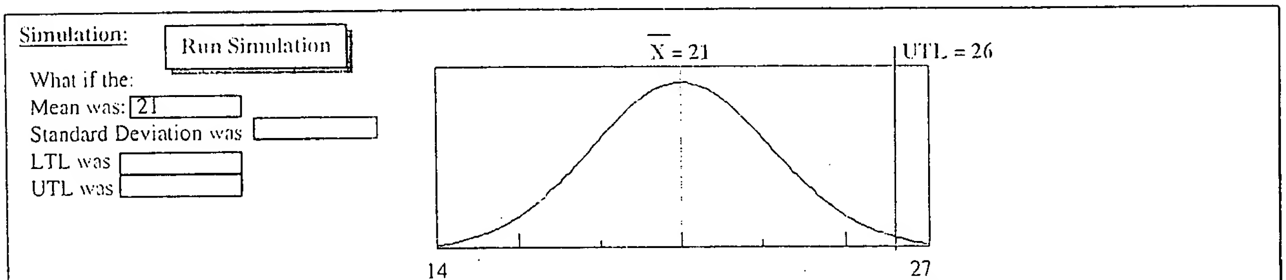
Six Sigma enabled BIS reporting helps answer statistical questions such as:

- What is my Mean, Standard Deviation, Median, and number of data points?
- What is my Actual % below and above my targets?
- What is the 95% Confidence Interval - what range does 95% of my data fall into?

- What is the Anderson-Darling value (how close am I to a normal distribution)?
- What is my Sigma value?
- What is the probability (or risk) of being outside of my target limits?

Run scenarios to simulate change

Another feature of the Six Sigma enabled BIS reporting is the ability to run pure simulations based on the data from the previous report. A separate (linked) HTML page would let you change the Mean, Standard Deviation, or Targets and recalculate the data very quickly via a simulation of a normal distribution. The simulation would look like the following:



Measure	Mean	Standard Dev	LTL	UTL	95% CI	DPMO	Sigma
Book to Ship Days	21	1.7		26	17-24	1,337	4.5

There is a .16% probability of being above the Upper Target Limit (UTL) and a 0% probability of being below the Lower Target Limit (LTL). The overall risk of being outside of the Target Limits is .16%.

A single pipeline for a multidimensional view of your data

The advantage is a quick way of modeling the changes in the Target Limits, Mean, or Variation (Standard Deviation) and understanding the corresponding impact on the Sigma Value, Confidence Interval, Risk Factors, etc. This information becomes very important in determining if you should try moving the mean (average) or reducing the variation of a process. In the previous example, you can simulate reducing the average Book to Ship cycle time below 21 days, or making the process more consistent by reducing the variation. This simulation can help you determine the best approach for improving the process and the potential benefits of increasing the process capability.

Conclusion

Six Sigma is rapidly being deployed in more and more businesses and increasing the competitive edge to an even greater limit. By integrating Six Sigma analysis and BIS, Oracle provides a unique and comprehensive solution for truly understanding your key Business Performance Measures. It provides:

- One set of intelligence reports for simple, effective analysis and a more sophisticated, statistical view of your performance
- Easy deployment across the enterprise with any standard web browser
- Consistent user interface & organization across all functions of the enterprise
- Shared, common dimensions for a multi-faceted view of enterprise-wide data

Whether or not your company is currently using the Six Sigma methodology, this single solution offers a quick return on investment and increased competitive advantage.

Exhibit B

Copy of portions of the internal confidential Oracle paper entitled "Six Sigma Enabled Statistical Intelligence Feature (SsESI) High Level Design Oracle Business Intelligence System" created in November 1999 and last updated September 20, 2000.

SIX SIGMA ENABLED STATISTICAL INTELLIGENCE FEATURE (SsESI)

High Level Design

Oracle Business Intelligence System

Author:	Tim Dubois
Creation Date:	11/24/99 1:30 PM
Last Updated:	9/20/00 8:48 AM
Version:	V 1.4

NOTE: The following information is confidential and is for internal use only.

ORACLE
Applications

Document Control

Change Record

Date	Author	Version	Change Reference
7/28/99	Tim Dubois	V1.0	Initial document
12/8/99	Tim Dubois	V1.1	Updates to content - formula for Sigma
12/10/99	Tim Dubois	V1.2	Added Range flexibility
12/17/99	Tim Dubois	V1.3	Data changes
9/20/00	Tim Dubois	V1.4	Wording change updates

Contributors

Name	Position
Tim Dubois	Senior Product Analyst, Operations and Supply Chain Int.
Jacques Senchet	Product Manager, Operations and Supply Chain Int.

Reviewers

Name	Position
Jacques Senchet	Product Manager, Operations and Supply Chain Int.
Kurt Robson	VP, BIS Core & EDW
Nadeem Syed	Senior Director, Mfg. & Planning
Elaine Wan	Product Manager, Process Mfg.
Yashpaul Dogra	Senior Product Manager, Purchasing Intelligence
Dana Lieberman	Director Applications Development, Financials
Sam Smith	Product Manager, HR
Jeff Kirk	Senior Product Manager, BIS Core
Steven Chan	Development Manager, BIS Core
Mike Graves	Group Manager, CRM - BIS

References

Document	Author
The Vision of Six Sigma	Mikel J. Harry
Introduction to Quality Control	Donald DelMar/George Sheldon

Contents

Overview

This document provides a high-level overview of the Six Sigma Enabled Statistical Intelligence (SsESI) feature for the Oracle Business Intelligence System (BIS) .

The current Business Intelligence System displays information in a number of different formats such as Line Graphs, Bar Charts, Pie Charts, Tabular Reports, etc. The intent of the Six Sigma Enabled Statistical Approach is to allow you to better understand the data through statistics and make more comprehensive and better decisions. You should also be able to follow the Six Sigma philosophy through the use of the Six Sigma Enabled features. The intent is to make this a feature or "plug-in" to the current BIS Viewer technology and add the new analytical ability that is discussed in this HLD.

The default Statistical view will be in a Histogram format to include basic statistical information such as Mean, Standard Deviation, Median, etc. The report will also include advanced statistical information such as the Probability of being above or below the Target Limits and a calculated Sigma Value. The following are the major points of the proposed Intelligence product:

- Select the "Statistical View By" from the current BIS report, where appropriate.
- View of data in histogram format.
- Basic statistics such as Mean, Standard Deviation, Median, A-D Normality, etc.
- Incorporation of Targets - view data against Upper and Lower Target Limits and show actual % of data above and below Target Limits.
- Theoretical view of data - show % of data expected to be above and below Target Limits based on Mean and Standard Deviation. (Based on Normal Distribution)
- Six Sigma view of data - display the "Sigma" value of the data. The Sigma value is a measure of variance defined as 3 defects per million opportunities. (Based on Normal Distribution)
- Simulation capability - view data set interactively with the ability to change the Mean, Standard Deviation, and Upper and Lower Target Limits to understand how the overall model responds.
- Data Filtering and Modeling- select different parameters to view data by in order to identify areas of opportunity (such as Time, Product Group, Customer, # of Bins, Target Limits, etc.).

This Intelligence feature will be designed to be a "Plug-In" feature to all the existing Intelligence products. Many measures currently defined could be viewed in an Six Sigma Enabled Statistical Format. For example, Gross Margin, Return %, Delivery %, or Book to Ship Cycle Time could all be analyzed with advanced statistics and viewed as a Histogram.

The SsESI Feature would be a common platform to view existing measures in a Six Sigma Enabled Statistical format with the ability to perform "what-if" scenarios.

Definitions

Actual

The calculated value for a performance measure. Collection programs will populate summary tables with calculated values and/or the values will be calculated in views. Alerts will compare the actual value to the targets in the Performance Management Framework. This actual value will display on the Personal Homepage and on Notification messages.

Dimension

A Dimension is a logical entity with respect to which data might be organized and analyzed. For example, data might be organized by dimensions such as 'Time', 'Item', or 'Trading Partner'

Dimension Level

The level of granularity for a dimension used in selecting and sorting data within the BIS reports, workbooks and performance management framework. Dimension levels form a hierarchy of specificity that together identify the dimension. For example, with the Time dimension, Year, Quarter, and Month are the different dimension levels.

Performance Management Framework

The BIS component that allows implementation of performance measure tracking. The framework is used to identify and store the performance measure targets and tolerances, alerts to calculate actual values, and workflow to take action on "out of tolerance" situations.

Performance Measure

An indicator used to determine enterprise performance and success. A company will identify relevant performance measures based on the dynamics of the industry and the company's strategic and tactical goals. This term is often used in conjunction with Balanced Scorecard efforts. May also be known as a Key Performance Indicator (KPI). The performance measures can be viewed by their standard unit of measure or by a sigma value.

Target

The value specified for a specific performance measure at a certain dimension level and a specific dimension. For example; the target value of 12 might be set for the performance measure Inventory Turns, for the target level of Internal Organization and Time (Financial Period), and the specific dimensions of U.S. Manufacturing and calendar month. For an SsESI related report, the Upper and Lower Target Limits could also be defined for the Sigma calculation.

Target Level

Used with the Performance Management Framework to identify the dimension level associated with a specific target setup. For example; in setting up a target for the Inventory Turns performance measure, the target level might be Internal Organization and Time (Financial Period).

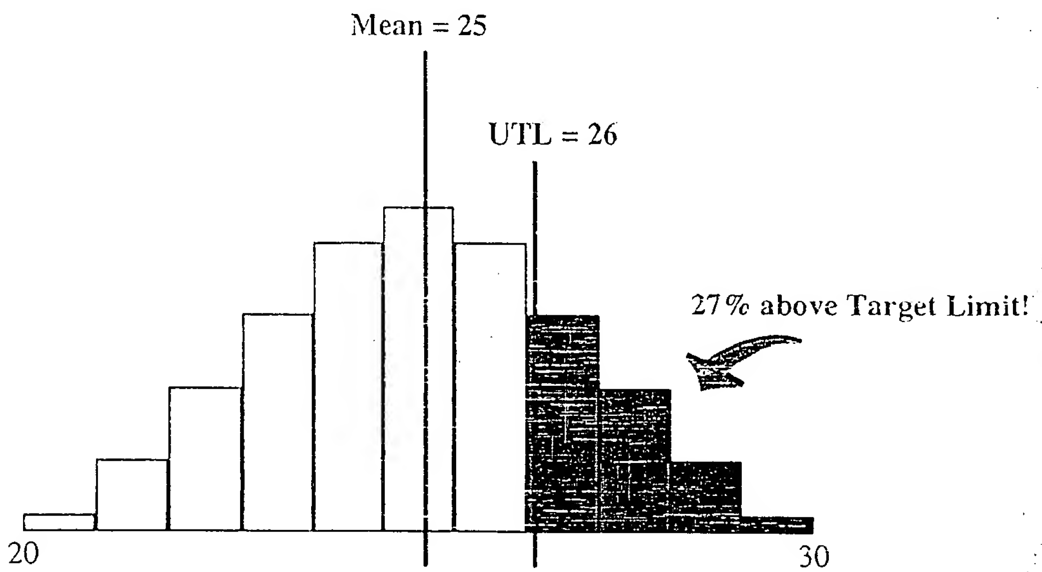
Tolerance and Lower Target Limit (LTL) & Upper Target Limit (UTL)

Used in the Performance Management Framework with Targets to specify a range or boundary around the Target value itself. For example; if the Target for Inventory Turns is 10, the tolerance might be set at +/- 10% around 10. In this case, the tolerance would be from 9 to 11, or you could simply type in 9 to 11 as the lower and upper Target Limits and the tolerance % would be filled in.

Basic Business Needs

Viewing Performance Measures with line graphs, bar charts, pie charts, etc. is a good standardized way of viewing data, but in many scenarios this is not enough to get complete and accurate understanding. Very often more advanced statistics are required to understand the entire issue or discover opportunities that would normally be overlooked. Analyzing data with Six Sigma Enabled Statistics will help you see more details of the data and have a better and more confident understanding of what is driving the higher level "Averages".

A statistical approach example: Book to Ship Cycle Time would normally be viewed by Time or Customer, etc. These calculations would be higher level summaries of each Book to Ship Cycle Time from each Sales Order. The summaries may show that the average (or mean) is within your specified Target Limits. You should be able to analyze the data with statistics to get a more complete understanding. If viewed with statistics, you may find that many of the Book to Ship Cycle Times are outside of the specified Target Limits. The Mean on the SsESI report would match the average on the BIS report, but you may see from the histogram that 27% of the Book to Ship Cycle Times are above the specified Target Limits and could potentially mean unhappy customers. This would also be evident by the calculated Sigma value. The example below represents this possibility:



Measure	Mean	Standard Dev	Median	Actual <LTL	Actual >UTL	95% CI	n	Target	A-D Norm	Sigma
Book to Ship Days	25	1.7	24.5		27%	21 - 29	1500	25.5	0.06	2.1

Business Questions /Ask Oracle

You should be able to answer the following business questions:

- For any given performance measure, what is the distribution (variation) of my data?
- What is the risk if I miss my target for any given performance measure?
- What is the impact on my performance measure if I simulate a change in Mean, Standard Deviation, Target Limits, # of Bins, or Range?
- What is the sigma value of my performance measures?
- What are the advanced statistics of my performance measures?

Major Features

General

- You should be able to filter the data by selecting different dimension levels.
- You should be able to view the data in a histogram format from the "Statistical View By".
- You should be able to view a comprehensive set of statistical measures around the selected performance measure, such as: Mean, Standard Deviation, Median, Sigma, etc.
- You should be able to get a clear understanding of the probability of being outside of your Target Limits based on the data set.
- You should be able to run "what-if" scenarios with different Means, Standard Deviations, Target Limits, of Bins, and Range.

Reports

Layout

Parameter Section
Histogram Section
Data Section
Simulation Section
Related Reports

The page layout will be the same as the current BIS 11i+ reports when first opened. There will be the added "View By" for a statistical view. When selected, the report will change to a histogram view, comprehensive statistical calculations in tabular format, and a simulation area on the bottom of the page.

Parameters

The Parameters shown on each report will not be changed from the original BIS report. The "View By" will have an additional selection called "Statistical View".

View by

The "View By" will always be in the context of the Performance Measure. For example, if Gross Margin is measured in Dollars, then the "View By" will be by Dollars. This will not be an option for selection.

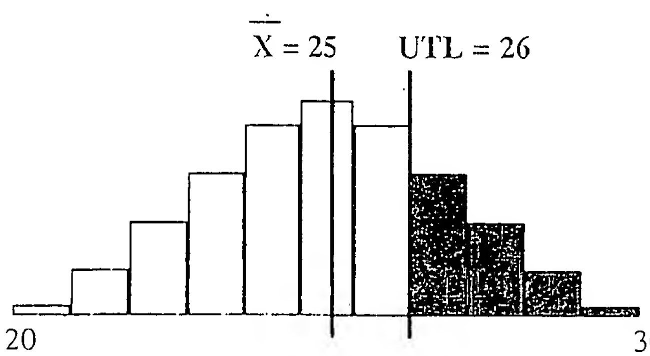
Graphs

Graph

Set of Books: Vision Operations (USA)
Trading Partner: CircuitTown
Year: FY-98 to FY-99
Area: All
Item: Laptop
View By: Statistics
Run

Book to Ship Cycle Time

Lower Target Limit: (Default will use PMF)
Upper Target Limit: 26 (Default will use PMF)
# of Bins: 11 (Blank will use Default value)
Range: From 20 To 30



The graph will always be a Histogram when the "Statistical View By" is selected.

- The Upper Target Limit (UTL) and Lower Target Limit (LTL) as well as the X bar (Mean) will be displayed on the graph as an overlay.

- The bars (or Bins) of the histogram will be displayed in yellow except for the areas outside of the Target Limits. These areas will be displayed in red.

Data

This is the standard Statistical Data Table that will be displayed for all histograms. The statement underneath is also standardized with the probability and risk percentages being calculated.

Measure	Mean	Standard Dev	Median	Actual <LTL	Actual >UTL	95% CI	n	Target	A-D Norm	Sigma
Book to Ship Days	25	1.7	24.5		27%	21 - 29	1500	25.5	0.06	2.1

There is a 28% probability of being above the Upper Target Limit (UTL) and a 0% probability of being below the Lower Target Limit (LTL). The overall risk of being outside of the Target Limits is 28%. (This is based on the assumption of Normal Data)

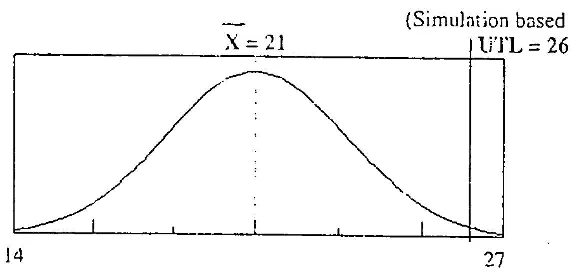
Simulation

You should be able to change the Mean, Standard Deviation, Upper Target Limit, and Lower Target Limit and run a "what-if" scenario or simulation. This entire simulation area will be java applet and will be independent of outside data. It will take the Mean, Standard Deviation, Upper and Lower Target Limit data from the Data table in the Actual area above. It will not retrieve data from the summary tables, transactional database, or PMF.

Simulation: Run Simulation

What if the:
Mean was: 21
Standard Deviation was
LTL was
UTL was

(Simulation based on Mean and Standard Dev only)



Measure	Mean	Standard Dev	LTL	UTL	95% CI	Sigma
Book to Ship Days	21	1.7		26	17-24	4.5

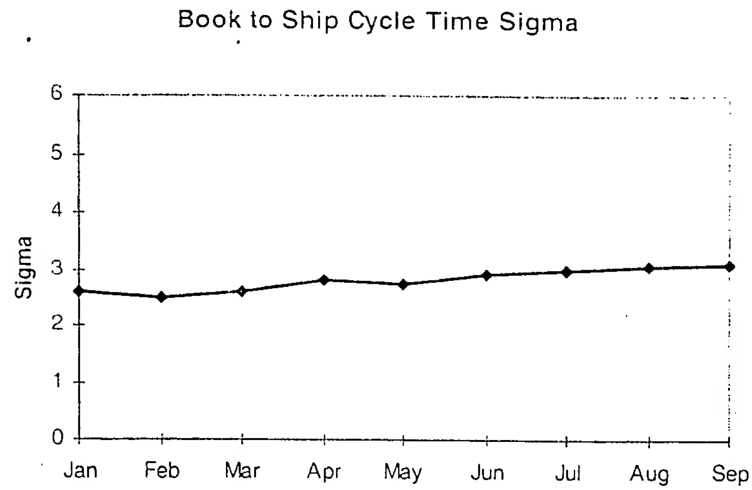
There is a .16% probability of being above the Upper Target Limit (UTL) and a 0% probability of being below the Lower Target Limit (LTL). The overall risk of being outside of the Target Limits is .16%.

Related Reports

You should be able to add Related Reports to the bottom of the layout similar to what will be available for 11i+ BIS Reports. Where appropriate, there will be preseeded Statistical Related reports that show the Sigma value by the dimensions listed on that BIS report i.e., by Time, Geography, Product, etc.

Related Statistical Report

The related statistical report graphs the sigma value by time - trending.



Performance Measure Targets

You should be able to define targets in all reports. To display in all reports, you would need to define targets for every combination of the dimensions and their levels. But, the simulation area will let you enter Upper and Lower Target Limits which are the Upper and Lower Target Limits from PMF. You should be able to use the simulation area to either enter new Limits or override existing Limits pulled in from PMF.

Statistical Measures (Calculations)

Mean

The Mean is the average of the data set. This calculation will be based off of the data that is defined by the user's selection of dimensions and parameters. Mean = Sum of data points/number of data points.

Standard Deviation

The Standard Deviation is the measure of variation for the given data set. The formula is given by: SQROOT(((n*Sum(x^2)) - (Sum(x))^2)/n*(n-1))

Median

The Median represents the middle of the data set. For example, Median (1, 2, 3, 4, 5) = 3 and the Median (1, 2, 3, 5) = 2.5

Lower Target Limit (LTL) and Upper Target Limit (UTL)

The Lower Target Limit and Upper Target Limit are not calculations. They are user defined in two possible ways.

1. You define Target Limits in PMF. The upper and lower ends of the range from PMF represent the UTL and the LTL. The Upper and Lower Target Limits will be defined in two possible ways:

   a. Input a Tolerance % around the Target. This will automatically fill in the Upper and Lower Target Limit numbers.

   b. Input the Upper and Lower Target Limit numbers. This will automatically fill in the Tolerance %.

2. You define the UTL and LTL for the simulation. The simulation area lets the user override the UTL and LTL brought in from PMF or enter them as new values if Targets in PMF were not set up.

Actual < LTL and Actual > UTL

The Actual < LTL is the Actual % of data that is below the Lower Target Limit. The Actual > UTL is the Actual % of data that is above the Upper Target Limit: Actual < LTL = (# of data points below the LTL)/Total # of data points * 100

95% CI (95% Confidence Interval)

The 95% Confidence Interval of the data set. It is the prediction interval where 95% of the data will fall between. 95% CI = Mean +/- 1.96 * Standard Deviation. For example, 95% CI where (Mean = 5, Stdev = 1) => 5 +/- 1.96 * 1 => 3.04 to 6.96

Range of Data

The Range of Data is simply the lowest value to the highest value in the given data set. The actual lowest and highest values will be returned for these fields, but you can override them by inputting values. The reason is to eliminate outlyers and recalculate.

# of Bins

The # of Bins (also known as Buckets or Classes) refers to the # of Bins in the Histogram (the bars that make up the graph). This is somewhat of a controversial issue since having too few Bins could cover up a trend and too many could dilute any trends. The rule of thumb is to choose between 5 and 20 Bins for any given data set. Following is a simple matrix to use:

# of different data points	# of bins
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12-100	11
101-200	15
> 200	20

n (Sample Size)

n represents the number of data points in the data set. It is the Sample Size.

A-D Normality (Anderson-Darling Normality Test)

The Anderson-Darling Normality test is a test to see if the data is normally distributed. The test will yield a Pvalue that should be larger than .05 for normal data. If the Pvalue is less than .05, it cannot be stated for certain that the data is normal.

$$A^2_n = (-\{\sum_{i=1}^{n}(2i-1)[\ln Z_i + \ln(1 - Z_{n+1-i})]\}/n) - n$$

The Pvalue is found in a corresponding cross reference table.

Probability of being below the LTL

The probability of being below the LTL is based off of a normal distribution and the Z deviate (Z table). To calculate the Probability, the Z deviate is first calculated as:

Z = (X - LTL)/Stdev [(Mean - Lower Target Limit) divided by the Standard Deviation

Once the Z deviate is found, the probability can be found by looking it up in the Z table which is found in any statistics book.

Probability of being above the UTL

The probability of being above the UTL is based off of a normal distribution and the Z deviate (Z table). To calculate the Probability, the Z deviate is first calculated as:

Z = (UTL - X)/Stdev [(Upper Target Limit - Mean) divided by the Standard Deviation

Once the Z deviate is found, the probability can be found by looking it up in the Z table which is found in any statistics book.

Sigma or Z (Short Term)

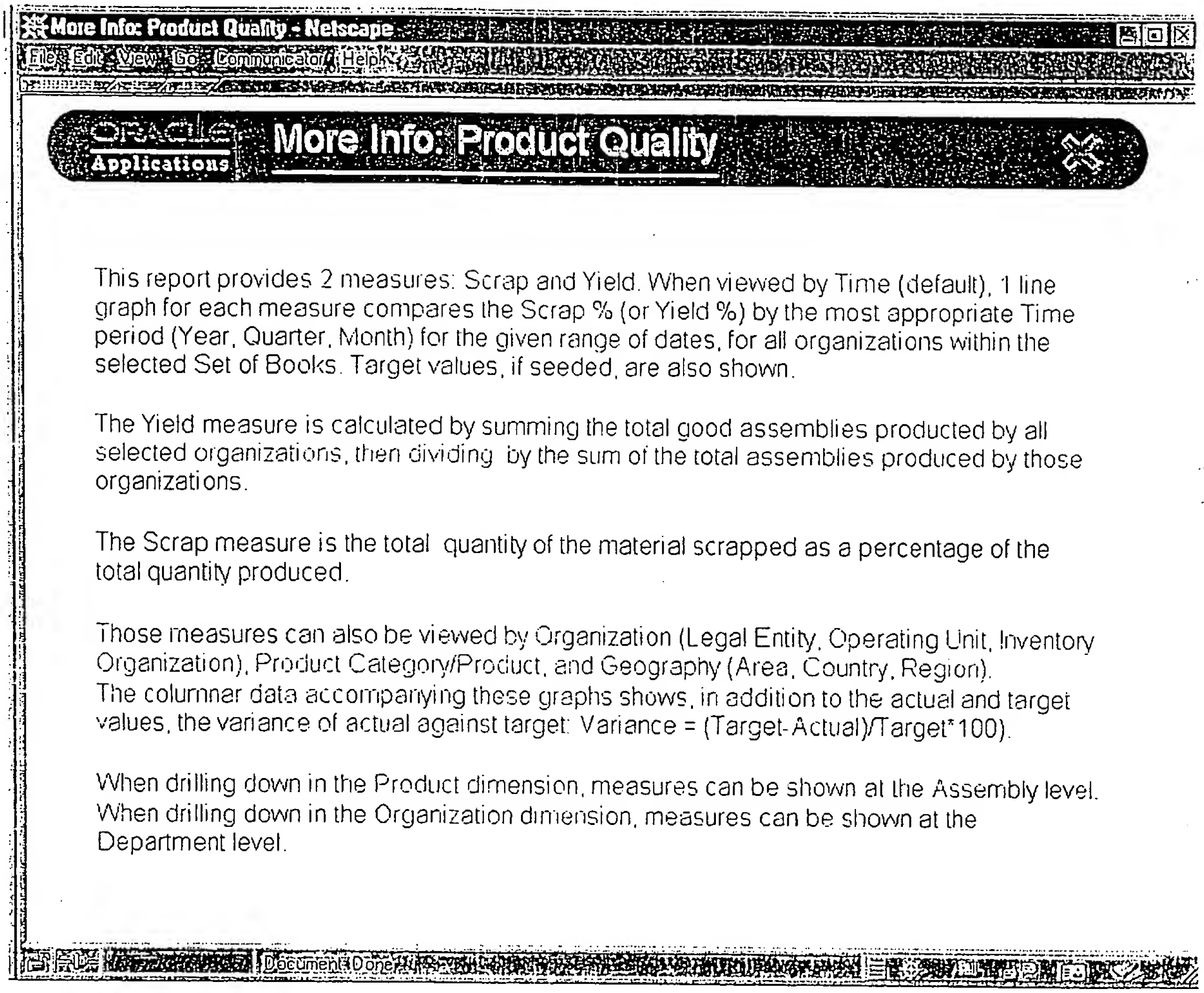
The value is calculated from the Z table. The "Probability of being above the UTL" is added to the "Probability of being below the LTL". This Total Probability is looked up on the Z table (area under the curve) and related back to a Z deviate. This value represents the Long Term Sigma.

A common rule of Six Sigma Methodology says that a Short Term Sigma can be represented as the Long Term Sigma + a 1.5 Sigma shift. This reasoning is based on the fact that over a long period of time, the distribution will spread out due to time related sources of error which tend to upset process centering as compared to the Short Term Data gathering/analysis. The "Six Sigma Level of Excellence" is based off of the short term (Zst). If your data is short term in nature, then the resultant Sigma value will be short term. If your data is long term in nature, the Zst is calculated off of the Long Term Sigma + 1.5. So, Zst = Zlt + 1.5 shift. For more information about the short and long term Sigma value and the shift, see Appendix 1.

More Information

Help Text

The help text associated with each report will be similar to below:



More Info: Product Quality - Netscape

More Info: Product Quality

This report provides 2 measures: Scrap and Yield. When viewed by Time (default), 1 line graph for each measure compares the Scrap % (or Yield %) by the most appropriate Time period (Year, Quarter, Month) for the given range of dates, for all organizations within the selected Set of Books. Target values, if seeded, are also shown.

The Yield measure is calculated by summing the total good assemblies producted by all selected organizations, then dividing by the sum of the total assemblies produced by those organizations.

The Scrap measure is the total quantity of the material scrapped as a percentage of the total quantity produced.

Those measures can also be viewed by Organization (Legal Entity, Operating Unit, Inventory Organization), Product Category/Product, and Geography (Area, Country, Region).
The columnar data accompanying these graphs shows, in addition to the actual and target values, the variance of actual against target: Variance = (Target-Actual)/Target*100).

When drilling down in the Product dimension, measures can be shown at the Assembly level. When drilling down in the Organization dimension, measures can be shown at the Department level.

There will be a help screen like above for each report that will include:

- A description of the measure
- The actual Calculation

Bubble Text

The bubble text associated with this report is:

TBD

Setups (TBD)

1. Run the Concurrent Program (TBD)

Navigate to appropriate application area and launch the related concurrent program if the report is based off of a summary table. This is not required if the report is built off of the transactional database alone.

This concurrent program needs to be run for a date range. If the date range is left NULL, it will be run for the entire system to date. The concurrent program will be populating the summary table which can then be used by the view for the report.

2. Set up Targets. (Optional)

If users would like to see targets displayed in the reports, they would need to define targets in PMF for the report. Otherwise, Target Limits can be set as a simulation in the histogram reports.

Open Issues

1. Would this be called a feature or a product?

Since this is more of a "plug-in" than a stand alone product, what is the correct terminology for it?

2. PMF - ability to enter Upper and Lower Target Limits?

How will the user enter Upper and Lower Target Limits in PMF? Currently the Target is defined with a Tolerance (range) around the Target. The user should be able to enter hard numbers for the Upper and Lower Target Limits as well as the choice for a tolerance. Can it be set up to let the user pick one option and automatically fill in the other?

3. Performance is concern

The Statistical analysis will need to be performed with the lowest level of data granularity. This could mean hundreds of thousands of rows of data to be crunched in many ways. Plus, a simulation would require all the calculations to be rerun instantaneously. How will the performance be guaranteed?

4. Sigma Value Calculation

The calculation for Sigma can be found with a few different formulas. They are all very complicated due to algebraic simulation of integration to find the area under the curve.

The Six Sigma calculation has been successfully reversed engineered. It is completely based off of the Z table and therefore is wide open for public use.

5. User selectable data range?

Should the user have the ability to change the upper and/or lower data range of the actual data displayed in the graph and calculations? The reason would be to eliminate outlyers in the actual data. For example, if most of the data was between 20 and 30 days and there were a few data points at 1 or 2 days, that could make a major change in the calculations. If the user could restrict or filter those data points out, the actual data would be more meaningful.

Added the ability for you to define the range in the parameters section of the report.

Guidelines for the Correction of Sigma Values (Excerpt from "The Vision of Six Sigma: Tools and Methods for Breakthrough" by Mikel J. Harry - 1994

Guideline 1: If a metric is computed on the basis of data gathered over many cycles or time intervals, the resultant value should be regarded as a long-term measure of performance. Naturally, the long-term metric must be converted to a probability. Once expressed as a probability, Z.lt value may be established by way of a table of area-under-the-normal-curve, or any acceptable computational device. If we seek to forecast short-term performance (Z.st), we must add a shift factor (Z.shift) to Z.lt so as to remove time related sources of error which tend to upset process centering. Recognize that the actual value of Z.shift is seldom known in practice; therefore, it may be necessary to apply the accepted convention and set Z.shift = 1.50; otherwise, use the actual value. As a consequence of this linear transformation, the final Z value should reflect only random sources of error and, therefore, serve as a projection of short-term performance. Thus, we are able to artificially remove the effect of nonrandom influences (i.e., normal process centering errors) from the analysis via the transform Z.st = Z.lt + Z.shift.

Guideline 2: If the metric is computed on the basis of data gathered over a very limited number of cycles or time intervals, the resultant value should be regarded as a short-term measure of performance. Naturally, the short-term metric must be converted to a probability. Once expressed as a probability, Z.st may be established by way of a table of area-under-the-normal-curve, or any acceptable computational device. If we seek to forecast long-term performance, we must subtract Z.shift from the Z.st so as to approximate the long-term capability. Recognize that the actual value of Z.shift is seldom known in practice; therefore, it may be necessary to apply the accepted convention and set Z.shift = 1.50. If the actual value is known, use it. As a consequence of this linear transformation, the final Z value reflects both random and nonrandom sources of error and, therefore, is a projection of long-term performance. Thus, we are able to artificially induce the effect of nonrandom influences (i.e., normal process centering error) into the analysis by way of Z.st - Z.shift = Z.lt.

Guideline 3: In general, if the originating data is discrete by nature, the resulting Z transform should be regarded as long-term. The logic of this guideline is simple; a fairly large number of cycles or time intervals is often required to generate enough nonconformities from which to generate a relatively stable estimate of Z. Hence, it is reasonable to conclude that both random and nonrandom influences are reflected in such data. In this instance, guideline 1 would be applied.

Guideline 4: In general, if the originating data is continuous by nature and was gathered under the constraint of sequential or random sampling across a very limited number of cycles or time intervals, the resulting Z value should be regarded as short-term. The logic of this guideline is simple; data gathered over a very limited number of cycles or time intervals only reflects random influences (white noise) and, as a consequence, tends to exclude nonrandom sources of variation, such as process centering errors.

Guideline 5: Whenever it is desirable to report the corresponding "sigma" of a given performance metric, the short-term Z must be used. For example, let us suppose that we find 6210 ppm defective. In this instance, we must translate 6210 ppm into its corresponding "sigma" value. Doing so reveals Z.lt = 2.50. Since the originating data was long-term by nature, guideline 1 and 3 apply. In this case, Z.lt + Z.shift = 2.5 + 1.5 = 4. Since no other estimate of Z.shift was available, the convention of 1.5 was employed.

Guidelines for the Correction of Sigma Values (Excerpt from "The Vision of Six Sigma: Tools and Methods for Breakthrough" by Mikel J. Harry - 1994

Guideline 1: If a metric is computed on the basis of data gathered over many cycles or time intervals, the resultant value should be regarded as a long-term measure of performance. Naturally, the long-term metric must be converted to a probability. Once expressed as a probability, Z.lt value may be established by way of a table of area-under-the-normal-curve, or any acceptable computational device. If we seek to forecast short-term performance (Z.st), we must add a shift factor (Z.shift) to Z.lt so as to remove time related sources of error which tend to upset process centering. Recognize that the actual value of Z.shift is seldom known in practice; therefore, it may be necessary to apply the accepted convention and set Z.shift = 1.50; otherwise, use the actual value. As a consequence of this linear transformation, the final Z value should reflect only random sources of error and, therefore, serve as a projection of short-term performance. Thus, we are able to artificially remove the effect of nonrandom influences (i.e., normal process centering errors) from the analysis via the transform Z.st = Z.lt + Z.shift.

Guideline 2: If the metric is computed on the basis of data gathered over a very limited number of cycles or time intervals, the resultant value should be regarded as a short-term measure of performance. Naturally, the short-term metric must be converted to a probability. Once expressed as a probability, Z.st may be established by way of a table of area-under-the-normal-curve, or any acceptable computational device. If we seek to forecast long-term performance, we must subtract Z.shift from the Z.st so as to approximate the long-term capability. Recognize that the actual value of Z.shift is seldom known in practice; therefore, it may be necessary to apply the accepted convention and set Z.shift = 1.50. If the actual value is known, use it. As a consequence of this linear transformation, the final Z value reflects both random and nonrandom sources of error and, therefore, is a projection of long-term performance. Thus, we are able to artificially induce the effect of nonrandom influences (i.e., normal process centering error) into the analysis by way of Z.st - Z.shift = Z.lt.

Guideline 3: In general, if the originating data is discrete by nature, the resulting Z transform should be regarded as long-term. The logic of this guideline is simple; a fairly large number of cycles or time intervals is often required to generate enough nonconformities from which to generate a relatively stable estimate of Z. Hence, it is reasonable to conclude that both random and nonrandom influences are reflected in such data. In this instance, guideline 1 would be applied.

Guideline 4: In general, if the originating data is continuous by nature and was gathered under the constraint of sequential or random sampling across a very limited number of cycles or time intervals, the resulting Z value should be regarded as short-term. The logic of this guideline is simple; data gathered over a very limited number of cycles or time intervals only reflects random influences (white noise) and, as a consequence, tends to exclude nonrandom sources of variation, such as process centering errors.

Guideline 5: Whenever it is desirable to report the corresponding "sigma" of a given performance metric, the short-term Z must be used. For example, let us suppose that we find 6210 ppm defective. In this instance, we must translate 6210 ppm into its corresponding "sigma" value. Doing so reveals Z.lt = 2.50. Since the originating data was long-term by nature, guideline 1 and 3 apply. In this case, Z.lt + Z.shift = 2.5 + 1.5 = 4. Since no other estimate of Z.shift was available, the convention of 1.5 was employed.